

General Description

The Sanrise SRC65R082B is a high voltage power MOSFET, fabricated using advanced super junction technology. The resulting device has extremely low on resistance, low gate charge and fast switching time, making it especially suitable for applications which require superior power density and outstanding efficiency.

The SRC65R082B break down voltage is 650V and it has a high rugged avalanche characteristics. The SRC65R082B is available in TO-247, TO-263-2, TO-220C and TO-220F packages.

Features

- Ultra Low $R_{DS(ON)} = 82m\Omega @ V_{GS} = 10V$.
- Ultra Low Gate Charge, $Q_g = 110nC$ typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved
- Non-automotive Qualified

Application

- Telecom Power
- EV Charger
- High Power Application

Ordering Information

Circuit Type		SRC65R082B□□-□			
Package				E: Lead Free	
T: TO-247				G: Green	
S2: TO-263-2				Blank: Tube	
TF: TO-220F				TR: Tape & Reel	
TC: TO-220C					

Symbol

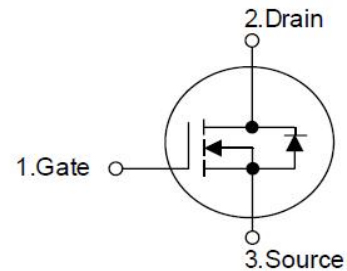


Figure 1 Symbol of SRC65R082B

Package Type

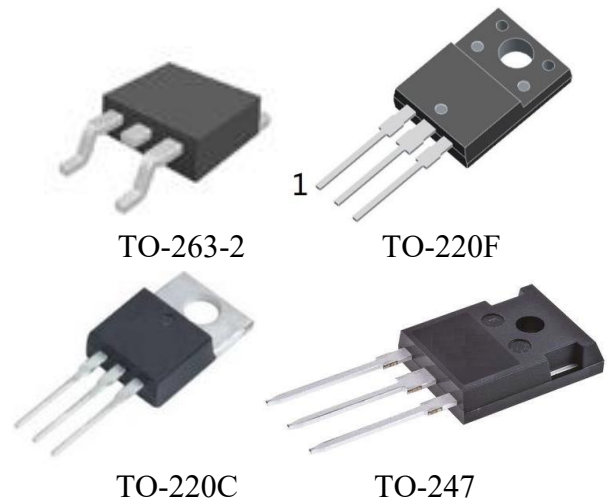


Figure 2 Package Types of SRC65R082B

Package	Part Number		Marking ID		Packing Type
	Lead Free	Green	Lead Free	Green	
TO-247	SRC65R082BT-E	SRC65R082BT-G	SRC65R082BTE	SRC65R082BTG	Tube
TO-263-2	SRC65R082BS2TR-E	SRC65R082BS2TR-G	SRC65R082BS2E	SRC65R082BS2G	Tape & Reel
TO-220F	SRC65R082BTF-E	SRC65R082BTF-G	SRC65R082BTFE	SRC65R082BTFG	Tube
TO-220C	SRC65R082BTC-E	SRC65R082BTC-G	SRC65R082BTCE	SRC65R082BTCG	Tube

Absolute Maximum Ratings^{Note 1}

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DS}	650	V
Gate-Source Voltage (static)		V_{GSS}	±20	V
Gate-Source Voltage (dynamic), AC(f>1Hz)		V_{GSS}	±30	V
Continuous Drain Current	$T_C=25^{\circ}\text{C}$	I_D	45	A
	$T_C=125^{\circ}\text{C}$		20.3	
Pulsed Drain Current (Note 2)		I_{DM}	135	A
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	125	mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.6	mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	5.0	A
Continuous Diode Forward Current		I_S	45	A
Diode Pulse Current		$I_{S,PULSE}$	135	A
MOSFET dv/dt Ruggedness, $V_{DS}\leq 480\text{V}$		dv/dt	80	V/ns
Reverse Diode dv/dt, $V_{DS}\leq 480\text{V}$, $I_{SD}\leq I_D$		dv/dt	50	V/ns
Operating Junction Temperature		T_J	150	°C
Storage Temperature		T_{STG}	-55 to 150	°C
Lead Temperature (Soldering, 10 sec)		T_{LEAD}	260	°C

Note:

1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. $I_{AS} = 5\text{A}$, $V_{DD} = 60\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

Thermal characteristics

Parameter		Symbol	Min	Typ	Max	Unit
Thermal resistance, Junction-to-Case	TO-220F	R_{thJC}			3.5	°C /W
	TO-220C				0.35	
	TO-247				0.35	
	TO-263				0.35	
Thermal resistance, Junction-to-Ambient	TO-220F	R_{thJA}			70	°C /W
	TO-220C				58	
	TO-247				58	
	TO-263				58	

Electrical Characteristics

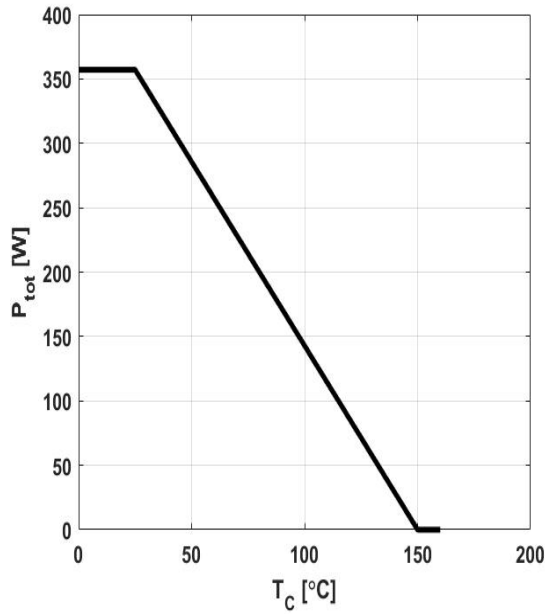
$T_J = 25^\circ\text{C}$, unless otherwise specified.

Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250uA	650			V
Zero Gate Voltage Drain Current		I _{DSS}	V _{DS} =650V, V _{GS} =0V			10	uA
Gate-Body Leakage Current	Forward	I _{GSSF}	V _{GS} =20V, V _{DS} =0V			100	nA
	Reverse	I _{GSSR}	V _{GS} =-20V, V _{DS} =0V			-100	
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =1.0mA	3.0	4.0	5.0	V
Static Drain-Source On-Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =24A		60	82	mΩ
Gate Resistance		R _G	f=1MHz, Open Drain		1.0		Ω
Dynamic Characteristics							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1MHz		4.3		nF
Output Capacitance		C _{OSS}			2.0		nF
Reverse Transfer Capacitance		C _{RSS}			50		pF
Effective output capacitance, energy related ^{NOTE5}		C _{O(er)}	V _{GS} =0V, V _{DS} =0...400V		94		pF
Effective output capacitance, time related ^{NOTE6}		C _{O(tr)}			550		
Turn-on Delay Time		t _{d(on)}	V _{DD} =400V, I _D =24A R _G =3.3Ω, V _{GS} =10V		16		ns
Rise Time		t _r			6.0		
Turn-off Delay Time		t _{d(off)}			98		
Fall Time		t _f			4.0		
Gate Charge Characteristics							
Gate to Source Charge		Q _{gs}	V _{DD} =480V, I _D =24A V _{GS} =0 to 10V		28.1		nC
Gate to Drain Charge		Q _{gd}			56.0		
Gate Charge Total		Q _g			110		
Gate Plateau Voltage		V _{plateau}			6.5		V
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _{SD} =24A		0.9	1.1	V
Reverse Recovery Time		t _{rr}	V _R =400V, I _F =24A dI _F /dt=100A/us		141		ns
Reverse Recovery Charge		Q _{rr}			0.83		uC
Peak Reverse Recovery Current		I _{rrm}			11.8		A

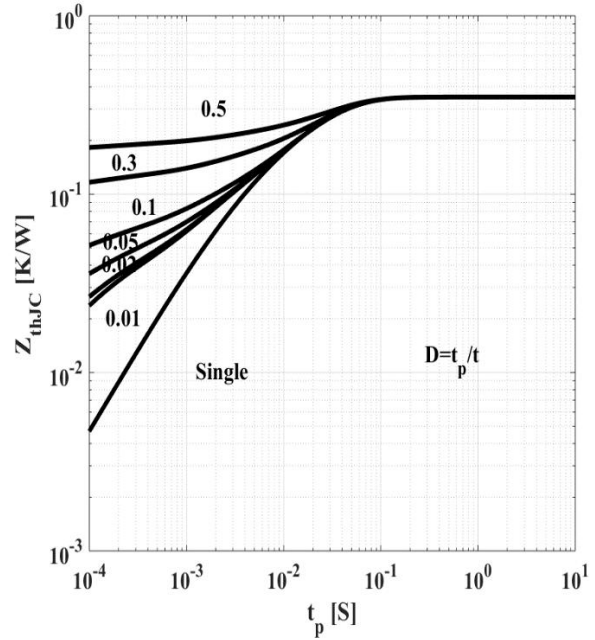
Note:

5. $C_{O(er)}$ is a fixed capacitance that gives the same stored energy as C_{OSS} while V_{DS} is rising from 0 to 480V

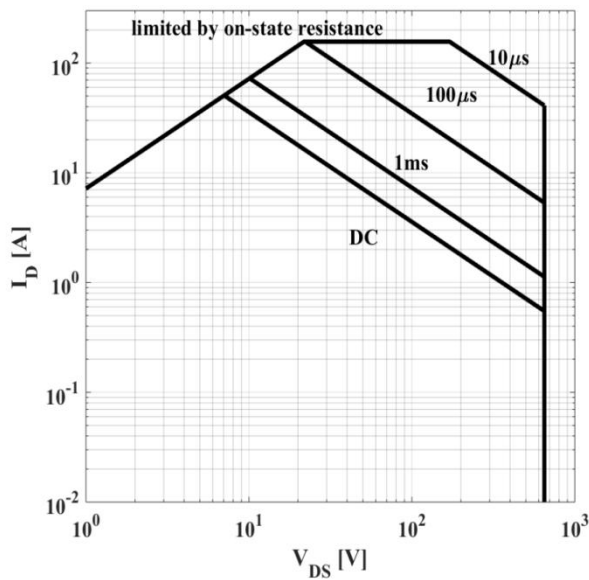
6. $C_{O(tr)}$ is a fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 480V

Typical Performance Characteristics
Figure 3: Power Dissipation


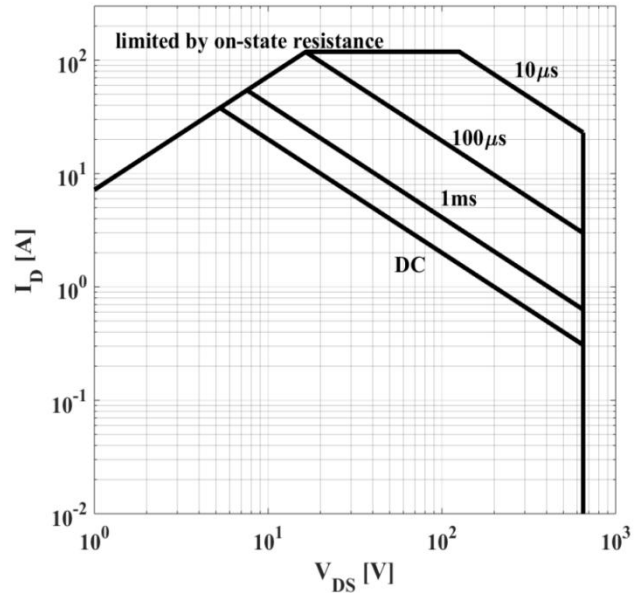
$$P_{tot} = f(T_c); \text{TO-247}$$

Figure 4: Max. Transient Thermal Impedance


$$Z_{(th)JC} = f(t_p); \text{parameter: } D = t_p/T; \text{TO-247}$$

Figure 5: Safe Operating Area


$$I_D = f(V_{DS}); T_c = 25^\circ\text{C}; V_{GS} > 7\text{V}; \text{parameter } t_p$$

Figure 6: Safe Operating Area


$$I_D = f(V_{DS}); T_c = 80^\circ\text{C}; V_{GS} > 7\text{V}; \text{parameter } t_p$$

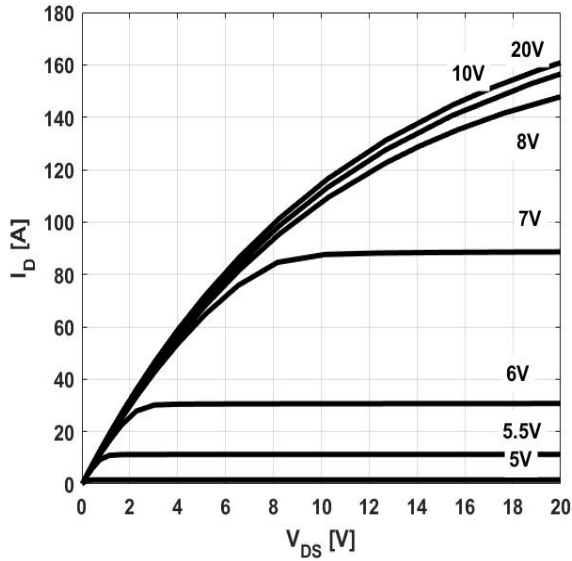
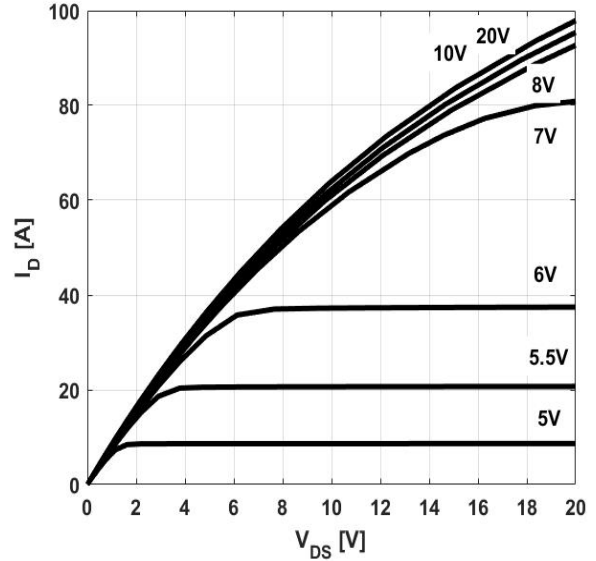
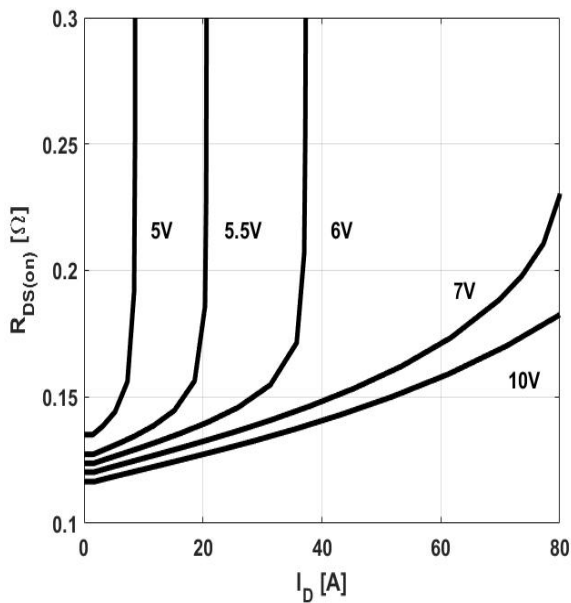
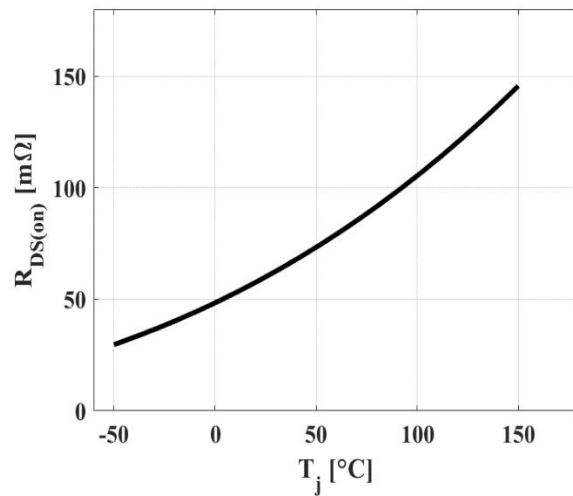
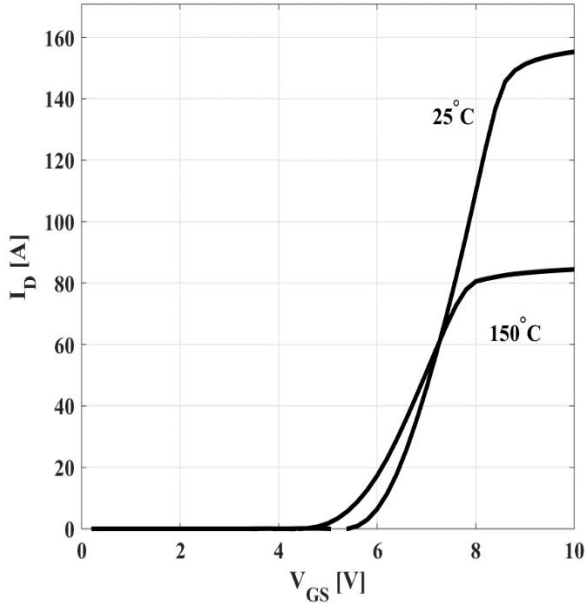
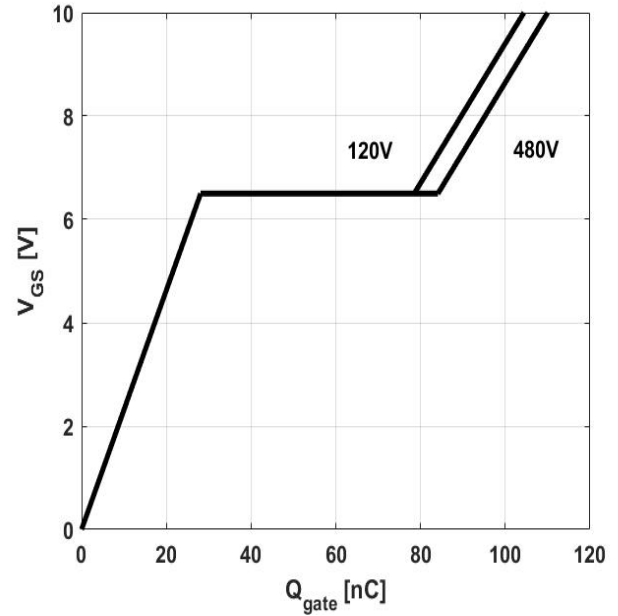
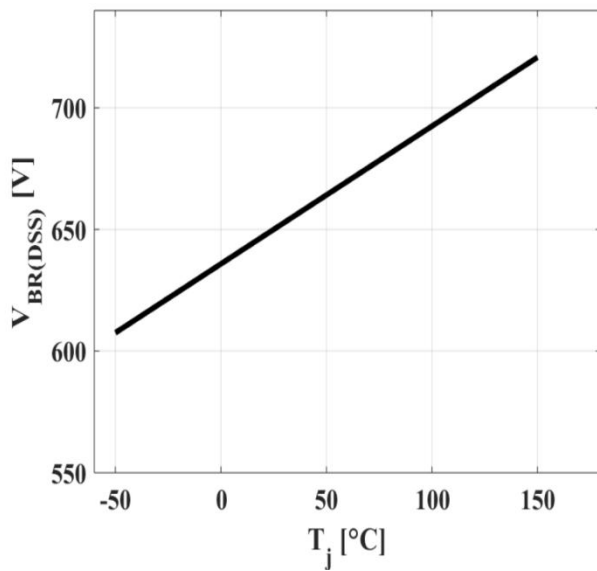
82mΩ, 650V, Super Junction N-Channel Power MOSFET
SRC65R082B
Figure 7: Typ. Output Characteristics

 $I_D = f(V_{DS}); T_j = 25^\circ\text{C}; \text{parameter: } V_{GS}$
Figure 8: Typ. Output Characteristics

 $I_D = f(V_{DS}); T_j = 125^\circ\text{C}; \text{parameter: } V_{GS}$
Figure 9: Typ. Drain-Source On-State Resistance

 $R_{DS(ON)} = f(I_D); T_j = 125^\circ\text{C}; \text{parameter: } V_{GS}$
Figure 10: Typ. Drain-Source On-State Resistance

 $R_{DS(ON)} = f(T_j); I_D = 24\text{A}; V_{GS} = 10\text{V}$

Figure 11: Typ. Transfer Characteristics


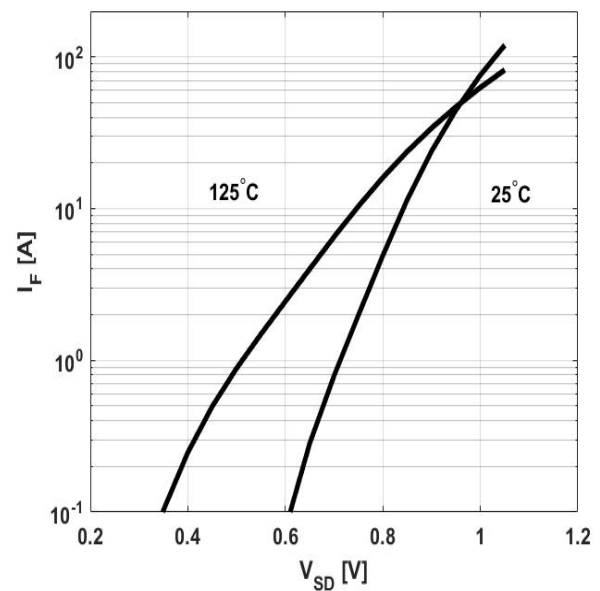
$$I_D = f(V_{GS}); V_{DS} = 20V$$

Figure 12: Typ. Gate Charge


$$V_{GS} = f(Q_{gate}), I_D = 24A \text{ pulsed}$$

Figure 13: Drain-Source Breakdown Voltage


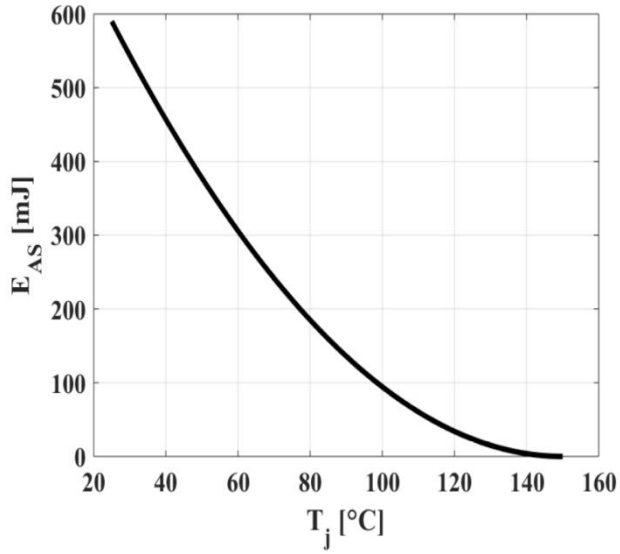
$$V_{BR(DSS)} = f(T_j); I_D = 1mA$$

Figure 14: Forward Characteristics of Reverse Diode


$$I_F = f(V_{SD}); \text{parameter: } T_j$$

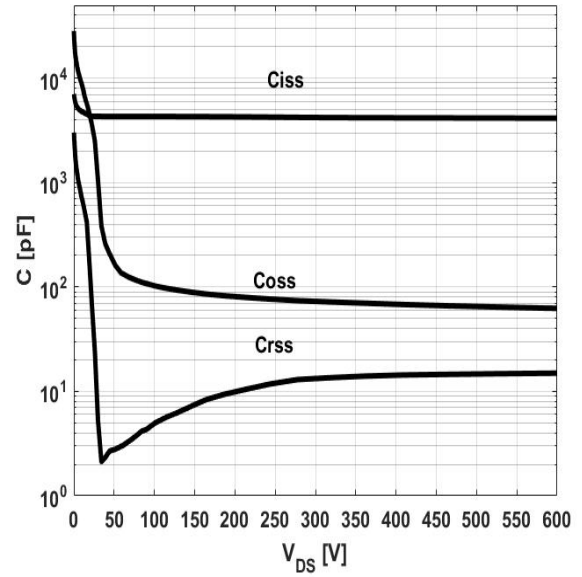
82mΩ, 650V, Super Junction N-Channel Power MOSFET
SRC65R082B

Figure 15: Avalanche Energy



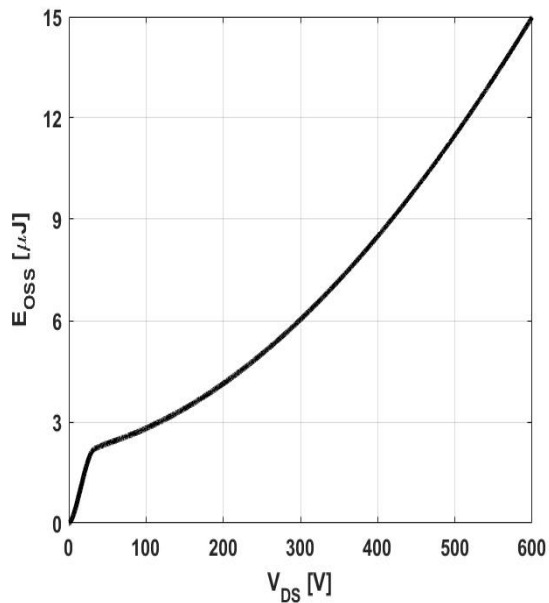
$$E_{AS}=f(T_j); I_D=4.8A; V_{DD}=60V$$

Figure 16: Typ. Capacitances



$$C=f(V_{DS}); V_{GS}=0; f=1MHz$$

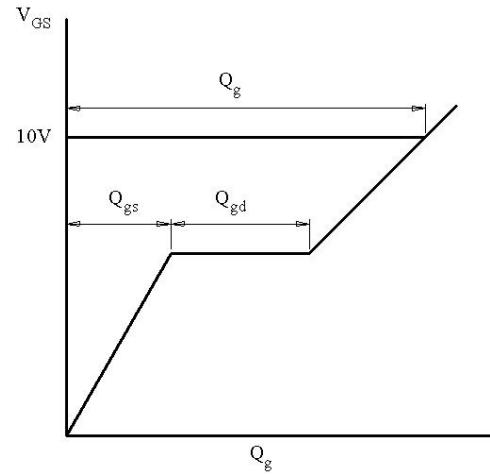
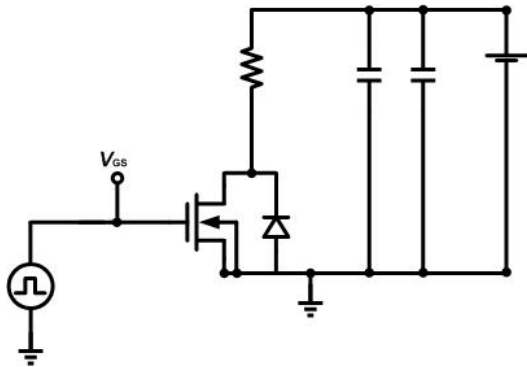
Figure 17: Coss Stored Energy



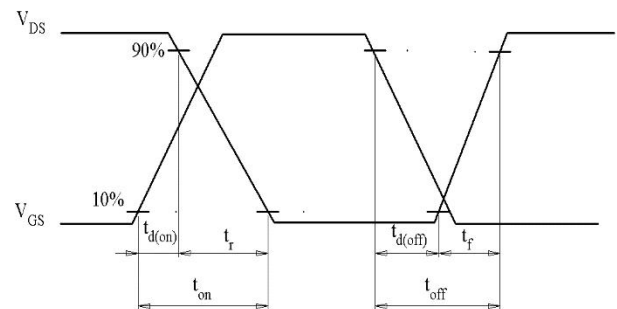
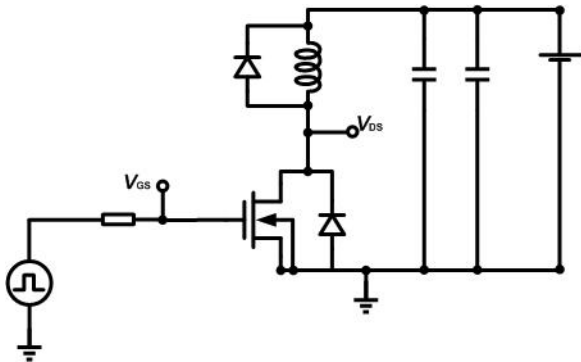
$$E_{OSS}=f(V_{DS})$$

Test Circuits

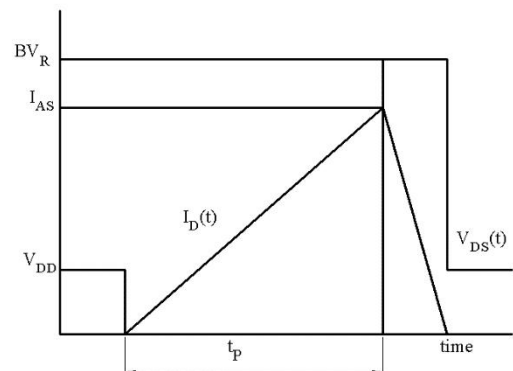
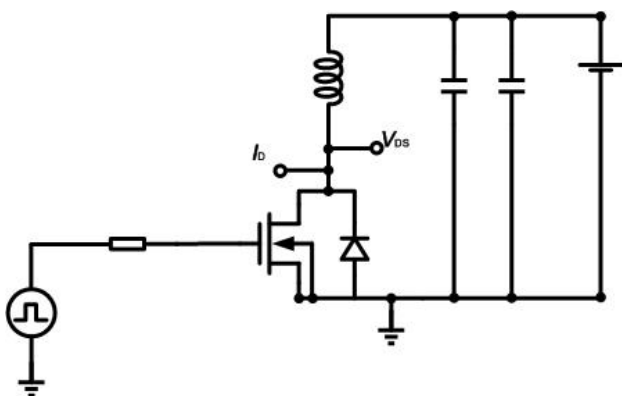
1. Gate Charge Test Circuit & Waveform



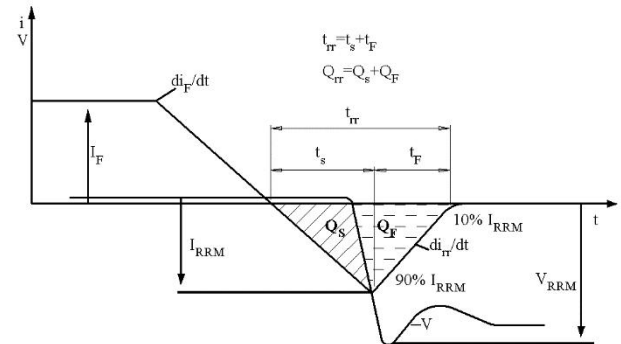
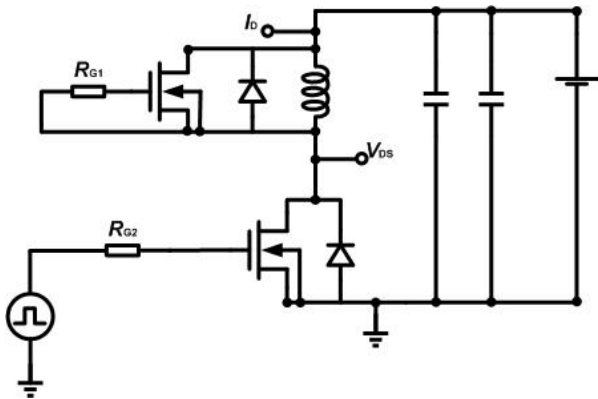
2. Switch Time Test Circuit

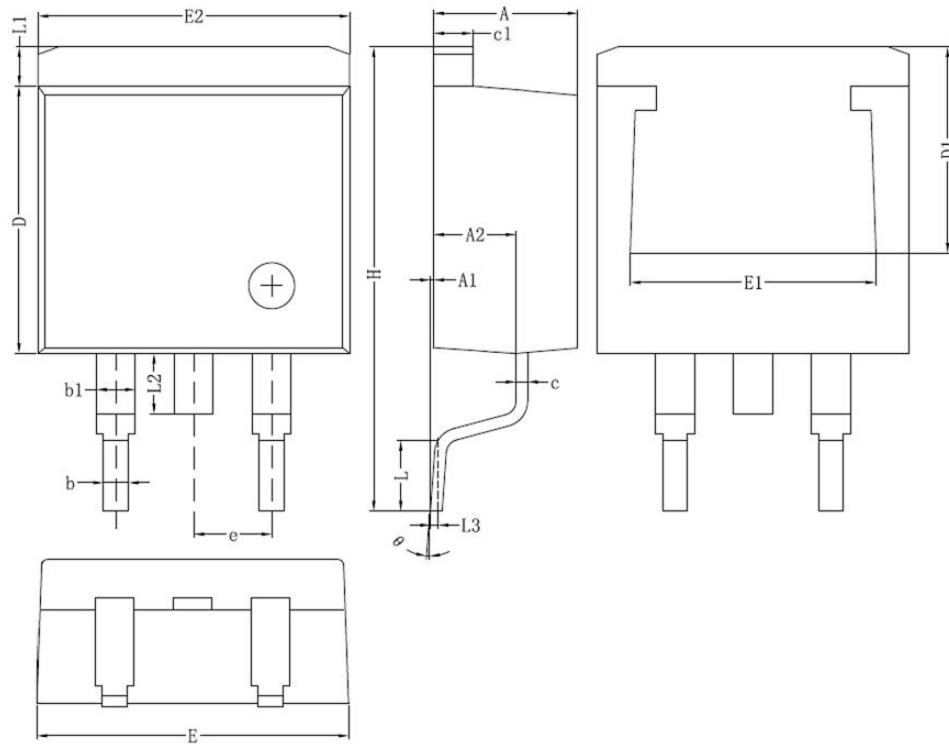


3. Unclaimed Inductive Switching Test Circuit & Waveforms

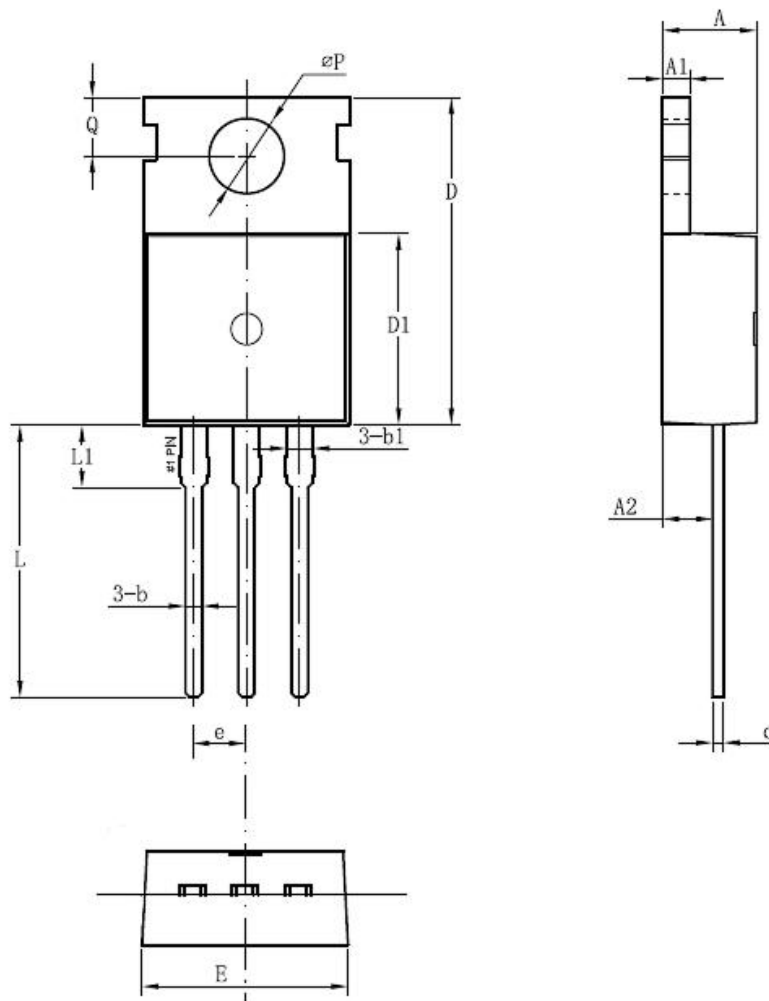


4. Test Circuit and Waveform for Diode Characteristics

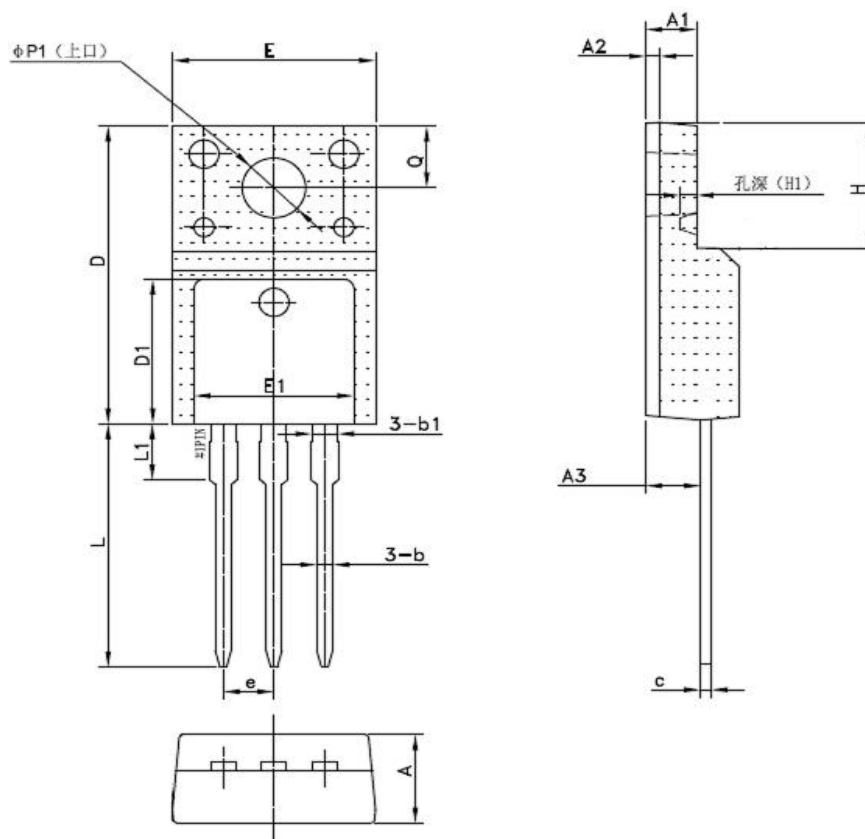


Mechanical Dimensions
TO-263-2
Unit: mm


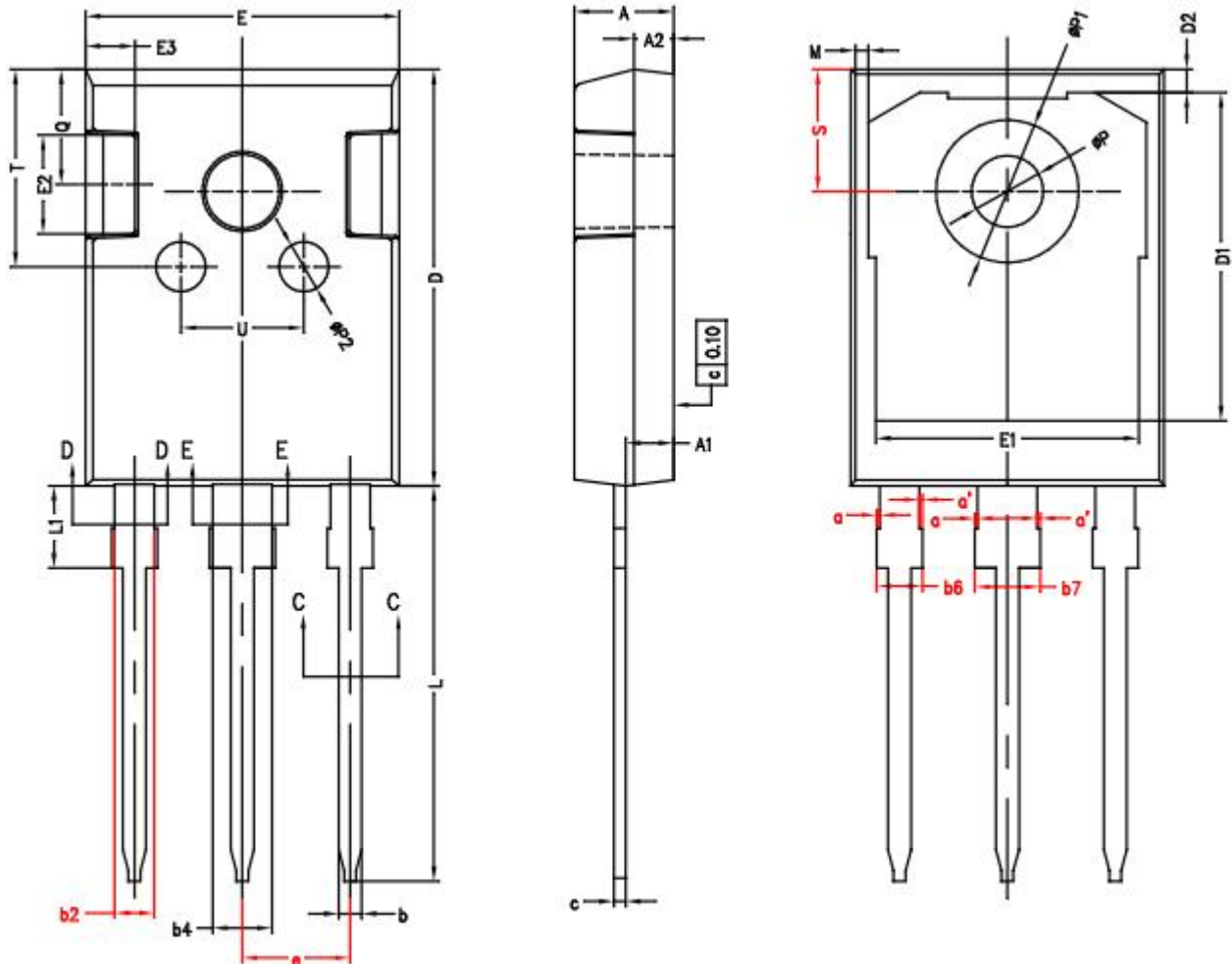
Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.60	4.85
A1	0.00	0.10	0.25
A2	2.59	2.69	2.89
b	0.70	0.81	0.96
b1	-	1.27	-
c	0.36	0.40	0.61
c1	1.15	1.27	1.40
D	8.55	-	9.40
D1	6.40	-	-
E	9.80	10.10	10.31
E1	7.60	-	-
E2	9.80	10.00	10.20
e	2.54(BSC)		
H	14.70	15.20	16.00
L	2.00	2.30	2.84
L1	1.00	1.27	1.40
L2	-	-	2.20
L3	-	0.25	-
θ	0°	-	8°

Mechanical Dimensions (Continued)
TO-220C
Unit: mm


Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.50	4.70
A1	1.20	1.30	1.40
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b1	-	1.27	-
c	0.40	0.50	0.65
D	15.20	15.70	16.20
D1	9.00	9.20	9.40
E	9.70	10.00	10.20
e	2.54(BSC)		
L	12.60	13.08	13.60
L1	-	3.00	-
ΦP	3.50	3.60	3.80
Q	2.60	2.80	3.00

Mechanical Dimensions (Continued)
TO-220F
Unit: mm


Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.70	4.90
A1	2.34	2.54	2.90
A2	-	0.70	-
A3	2.56	2.76	2.96
b	0.55	-	0.95
b1	-	1.28	-
c	0.42	0.50	0.70
D	14.70	-	16.07
D1	-	7.70	-
E	9.96	10.16	10.36
E1	-	8.00	-
e	2.54(BSC)		
H	-	6.70	-
(H1)	-	(0.81)	-
L	12.48	12.98	13.50
L1	-	2.93	-
ΦP1	-	3.18	-
Q	2.90	3.30	3.50

Mechanical Dimensions
TO-247
Unit: mm


Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.90	5.00	5.10	E2	4.90	5.00	5.10
A1	2.31	2.41	2.51	E3	2.40	2.50	2.60
A2	1.90	2.00	2.10	e	5.34	5.44	5.54
b	1.12	-	1.22	L	19.80	19.92	20.10
b1	1.11	1.16	1.18	L1	3.95	4.13	4.30
b2	1.96	-	2.06	P	3.50	3.60	3.70
c	0.59	-	0.66	P1	7.00	-	7.40
D	20.90	21.00	21.10	P2	2.40	2.50	2.60
D1	16.25	16.55	16.85	Q	5.60	-	6.00
D2	1.05	1.20	1.35	S	6.05	6.15	6.25
E	15.70	15.80	15.90	T	9.80	-	10.20
E1	13.10	13.30	13.50	U	6.00	-	6.40



Shenzhen Sanrise Technology Co., LTD

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